Appendix 4-B.
Direct-Use Case Studies

The following case studies, obtained by running LMOP's LFGcost economic assessment tool, are example preliminary economic assessments for a direct-use (e.g., boiler) landfill gas (LFG) energy project. The first case, named "Direct Use 1" is a privately funded project at a landfill that already has an LFG collection and flaring system in place and requires 5 miles of pipeline to deliver the LFG to the end user. "Direct Use 2," a similar case, is for a landfill that does not have an LFG collection and flaring system and must include collection system and flare costs in the economic assessment. Several other cases, including projects with 10-mile pipelines and projects that use municipal funding, are also included. The summary table below describes each case. The following pages present the actual output from LFGcost-Web.

Privately Developed Projects

Case Study Name	Project Description	Financing and Revenue Elements	Financial Results Summary
Direct Use 1	• Direct-use project with 5-mile pipeline (includes condensate management) • No collection and flaring system required	• 20% down payment, 80% financed • 8% interest rate • $5/MMBtu (default) LFG price	Capital cost: $2,779,773 O&M cost: $128,782 NPV: $3,145,698 IRR: 57% NPV payback (years): 3
Direct Use 2	• Direct-use project with 5-mile pipeline (includes condensate management) • LFG collection and flaring system required	• 20% down payment, 80% financed • 8% interest rate • $5/MMBtu (default) LFG price	Capital cost: $4,629,695 O&M cost: $408,089 NPV: $476,674 IRR: 14% NPV payback (years): 12
Direct Use 3	• Direct-use project with 10-mile pipeline (includes condensate management) • No collection and flaring system required	• 20% down payment, 80% financed • 8% interest rate • $5/MMBtu (default) LFG price	Capital cost: $4,462,938 O&M cost: $128,782 NPV: $2,002,785 IRR: 28% NPV payback (years): 6
Direct Use 4	• Direct-use project with 10-mile pipeline (includes condensate management) • LFG collection and flaring system required	• 20% down payment, 80% financed • 8% interest rate • $5/MMBtu (default) LFG price	Capital cost: $6,312,860 O&M cost: $408,089 NPV: ($668,637) IRR: 6% NPV payback (years): none

Municipality-Developed Projects

Case Study Name	Project Description	Financing and Revenue Elements	Financial Results Summary
Direct Use 5	• Direct-use project with 5-mile pipeline (includes condensate management) • No collection and flaring system required	• 100% down payment using municipal budget • 6% discount rate • $5/MMBtu (default) LFG price	Capital cost: $2,779,773 O&M cost: $128,782 NPV: $7,627,800 IRR: 40% NPV payback (years): 3
Direct Use 6	• Direct-use project with 5-mile pipeline (includes condensate management) • No collection and flaring system required	• 20% down payment, 80% bond-financed • 6% interest rate, 6% discount rate • $5/MMBtu (default) LFG price	Capital cost: $2,779,773 O&M cost: $128,782 NPV: $7,501,924 IRR: 92% NPV payback (years): 2
Direct Use 7	• Direct-use project with 5-mile pipeline (includes condensate management) • LFG collection and flaring system required	• 100% down payment using municipal budget • 6% discount rate • $5/MMBtu (default) LFG price	Capital cost: $4,629,695 O&M cost: $408,089 NPV: $2,971,556 IRR: 15% NPV payback (years): 8
Direct Use 8	• Direct-use project with 5-mile pipeline (includes condensate management) • LFG collection and flaring system required	• 20% down payment, 80% bond-financed • 6% interest rate, 6% discount rate • $5/MMBtu (default) LFG price	Capital cost: $4,629,695 O&M cost: $408,089 NPV: $2,761,909 IRR: 24% NPV payback (years): 6

IRR: internal rate of return

MMBtu = million British thermal units

NPV = net present value

O&M = operation and maintenance

Case Study ID: Direct Use 1

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Private Finance

LFGE Project Type: Direct Use
5-Mile Pipeline

Date: Friday, September 04, 2009

Disclaimer:
LFGcost is a landfill gas energy project cost estimating tool developed for EPA's LMOP. LFGcost estimates landfill gas generation rates using a first-order decay equation. This equation is used to estimate generation potential but can not be considered an absolute predictor of the rate of landfill gas generation. Variations in the rate and types of incoming waste, site operating conditions, and moisture and temperature conditions may provide substantial variations in the actual rates of generation.

The costs that are estimated by LFGcost are based on typical project designs and for typical landfill situations. The model attempts to include all equipment, site work, permits, operating activities, and maintenance that would normally be required for constructing and operating a typical project. However, individual landfills may require unique design modifications which would add to the cost estimated by LFGcost.

Analyses performed using LFGcost are considered preliminary and should be used for guidance only. A detailed final feasibility assessment should be conducted by qualified landfill gas professionals prior to preparing a system design, initiating construction, purchasing materials, or entering into agreements to provide or purchase energy from a landfill gas project.

Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	$3,145,698	*(at year of construction)*
Internal Rate of Return:	57%	
Net Present Value Payback (yrs):	3	*(years after operation begins)*
Installed Capital Costs:		
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$1,683,165	
Total Capital Costs:	$2,779,773	
O&M Costs:	$128,782	*(for initial year of operation)*

These financial results DO NOT include the costs associated with the LFG collection and flaring system.

Environmental Benefits

Benefits from Collecting and Destroying Methane (during the life of the project):

Lifetime	
(million ft^3 methane):	3,754
($MMTCO_2E$):	1.51E+00
Average Annual	
(million ft^3 methane/yr):	250
($MMTCO_2E$/yr):	1.01E-01

Benefits from Avoided Direct Use of Fossil Fuels (during the life of the project):

Lifetime ($MMTCO_2E$):	1.72E-01
Average Annual ($MMTCO_2E$/yr):	1.15E-02

Landfill Characteristics

Open Year:	1994
Closure Year:	2014
Waste-In-Place at Closure (tons)	4,000,000
Average Waste Acceptance (tons/yr):	200,000
Average Depth of Landfill Waste (ft):	50
Area of LFG Wellfield to Supply Project (acres):	80

Landfill Gas Generation, Collection, and Utilization

Modeling Parameters for First-Order Decay Equation:

Methane Generation Rate, k (1/yr):	0.040
Methane Generation Capacity, L_o (ft^3/ton):	3,204
Methane Content of LFG:	50%

Generated During Project Lifetime (ft^3/min):

Minimum:	865
Annual Average:	1,120
Maximum:	1,343

Collected During Project Lifetime (ft^3/min):

Minimum:	735
Annual Average:	952
Maximum:	1,141

Project Size:	Defined by User	
Design Flow Rate for Project (ft^3/min):	1,000	

Utilized by Project (ft^3/min):

Annual Average:	828

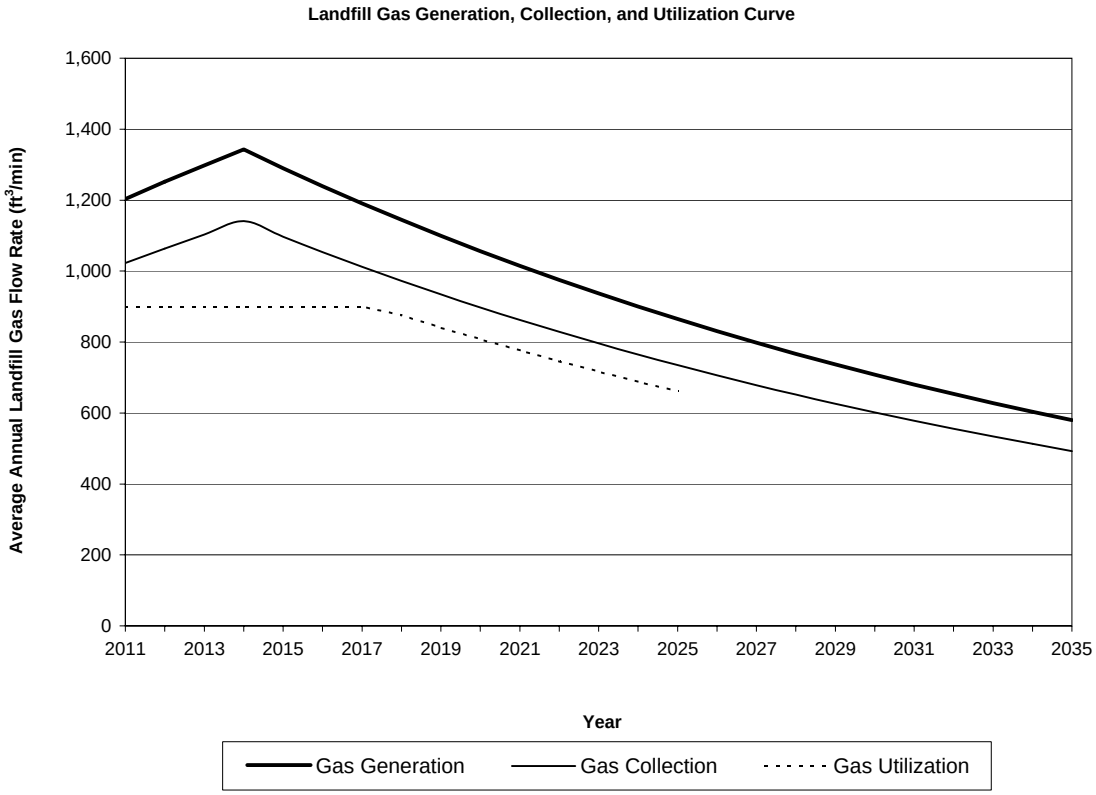
LFG Collection Efficiency:	85%	

Financial Assumptions

Loan Lifetime (years):	10	
Interest Rate:	8.0%	
General Inflation Rate:	2.5%	*(applied to O&M costs)*
Equipment Inflation Rate:	1.0%	
Marginal Tax Rate:	35.0%	
Discount Rate:	10.0%	
Down Payment:	20.0%	
Collection and Flaring Costs:	NOT Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	5.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5	



Case Study ID: Direct Use 2

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Private Finance
Including Costs for Gas Collection and Flare
LFGE Project Type: Direct Use
5-Mile Pipeline
Date: Friday, September 04, 2009

Disclaimer:
LFGcost is a landfill gas energy project cost estimating tool developed for EPA's LMOP. LFGcost estimates landfill gas generation rates using a first-order decay equation. This equation is used to estimate generation potential but can not be considered an absolute predictor of the rate of landfill gas generation. Variations in the rate and types of incoming waste, site operating conditions, and moisture and temperature conditions may provide substantial variations in the actual rates of generation.

The costs that are estimated by LFGcost are based on typical project designs and for typical landfill situations. The model attempts to include all equipment, site work, permits, operating activities, and maintenance that would normally be required for constructing and operating a typical project. However, individual landfills may require unique design modifications which would add to the cost estimated by LFGcost.

Analyses performed using LFGcost are considered preliminary and should be used for guidance only. A detailed final feasibility assessment should be conducted by qualified landfill gas professionals prior to preparing a system design, initiating construction, purchasing materials, or entering into agreements to provide or purchase energy from a landfill gas project.

Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	$476,674	*(at year of construction)*
Internal Rate of Return:	14%	
Net Present Value Payback (yrs):	12	*(years after operation begins)*
Installed Capital Costs:		
Gas Collection and Flare:	$1,849,922	
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$1,683,165	
Total Capital Costs:	$4,629,695	
O&M Costs:	$408,089	*(for initial year of operation)*

These financial results include the costs associated with the gas collection and flaring system.

Environmental Benefits

Benefits from Collecting and Destroying Methane (during the life of the project):

Lifetime	
(million ft^3 methane):	3,754
($MMTCO_2E$):	1.51E+00
Average Annual	
(million ft^3 methane/yr):	250
($MMTCO_2E$/yr):	1.01E-01

Benefits from Avoided Direct Use of Fossil Fuels (during the life of the project):

Lifetime ($MMTCO_2E$):	1.72E-01
Average Annual ($MMTCO_2E$/yr):	1.15E-02

Landfill Characteristics

Open Year:	1994
Closure Year:	2014
Waste-In-Place at Closure (tons)	4,000,000
Average Waste Acceptance (tons/yr):	200,000
Average Depth of Landfill Waste (ft):	50
Area of LFG Wellfield to Supply Project (acres):	80

Landfill Gas Generation, Collection, and Utilization

Modeling Parameters for First-Order Decay Equation:

Methane Generation Rate, k (1/yr):	0.040
Methane Generation Capacity, L_o (ft^3/ton):	3,204
Methane Content of LFG:	50%

Generated During Project Lifetime (ft^3/min):

Minimum:	865
Annual Average:	1,120
Maximum:	1,343

Collected During Project Lifetime (ft^3/min):

Minimum:	735
Annual Average:	952
Maximum:	1,141

Project Size:	Defined by User	
Design Flow Rate for Project (ft^3/min):	1,000	

Utilized by Project (ft^3/min):

Annual Average:	828

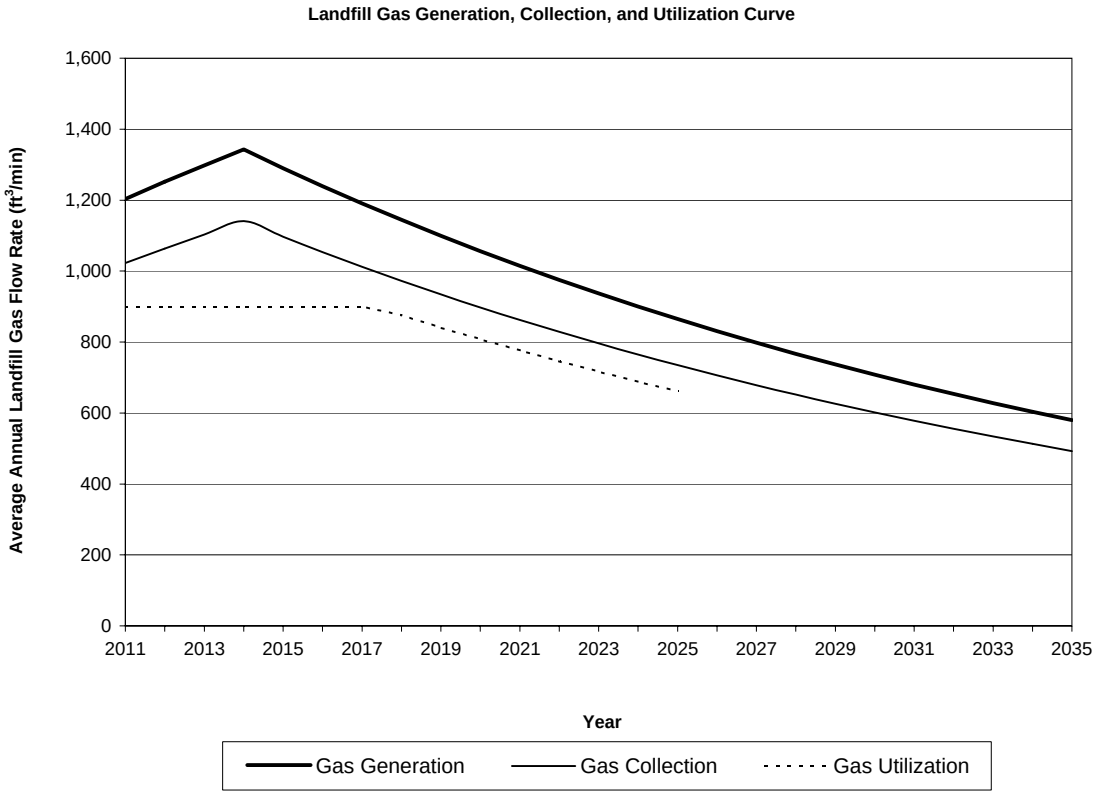
LFG Collection Efficiency:	85%	

Financial Assumptions

Loan Lifetime (years):	10	
Interest Rate:	8.0%	
General Inflation Rate:	2.5%	*(applied to O&M costs)*
Equipment Inflation Rate:	1.0%	
Marginal Tax Rate:	35.0%	
Discount Rate:	10.0%	
Down Payment:	20.0%	
Collection and Flaring Costs:	Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	5.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5	



Case Study ID: Direct Use 3

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Private Finance

LFGE Project Type: Direct Use
10-Mile Pipeline

Date: Friday, September 04, 2009

Disclaimer:
LFGcost is a landfill gas energy project cost estimating tool developed for EPA's LMOP. LFGcost estimates landfill gas generation rates using a first-order decay equation. This equation is used to estimate generation potential but can not be considered an absolute predictor of the rate of landfill gas generation. Variations in the rate and types of incoming waste, site operating conditions, and moisture and temperature conditions may provide substantial variations in the actual rates of generation.

The costs that are estimated by LFGcost are based on typical project designs and for typical landfill situations. The model attempts to include all equipment, site work, permits, operating activities, and maintenance that would normally be required for constructing and operating a typical project. However, individual landfills may require unique design modifications which would add to the cost estimated by LFGcost.

Analyses performed using LFGcost are considered preliminary and should be used for guidance only. A detailed final feasibility assessment should be conducted by qualified landfill gas professionals prior to preparing a system design, initiating construction, purchasing materials, or entering into agreements to provide or purchase energy from a landfill gas project.

Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	$2,002,785	*(at year of construction)*
Internal Rate of Return:	28%	
Net Present Value Payback (yrs):	6	*(years after operation begins)*
Installed Capital Costs:		
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$3,366,330	
Total Capital Costs:	$4,462,938	
O&M Costs:	$128,782	*(for initial year of operation)*

These financial results DO NOT include the costs associated with the LFG collection and flaring system.

Environmental Benefits

Benefits from Collecting and Destroying Methane (during the life of the project):

Lifetime	
(million ft^3 methane):	3,754
($MMTCO_2E$):	1.51E+00
Average Annual	
(million ft^3 methane/yr):	250
($MMTCO_2E$/yr):	1.01E-01

Benefits from Avoided Direct Use of Fossil Fuels (during the life of the project):

Lifetime ($MMTCO_2E$):	1.72E-01
Average Annual ($MMTCO_2E$/yr):	1.15E-02

Landfill Characteristics

Open Year:	1994
Closure Year:	2014
Waste-In-Place at Closure (tons)	4,000,000
Average Waste Acceptance (tons/yr):	200,000
Average Depth of Landfill Waste (ft):	50
Area of LFG Wellfield to Supply Project (acres):	80

Landfill Gas Generation, Collection, and Utilization

Modeling Parameters for First-Order Decay Equation:

Methane Generation Rate, k (1/yr):	0.040
Methane Generation Capacity, L_o (ft^3/ton):	3,204
Methane Content of LFG:	50%

Generated During Project Lifetime (ft^3/min):

Minimum:	865
Annual Average:	1,120
Maximum:	1,343

Collected During Project Lifetime (ft^3/min):

Minimum:	735
Annual Average:	952
Maximum:	1,141

Project Size:	Defined by User	
Design Flow Rate for Project (ft^3/min):	1,000	

Utilized by Project (ft^3/min):

Annual Average:	828

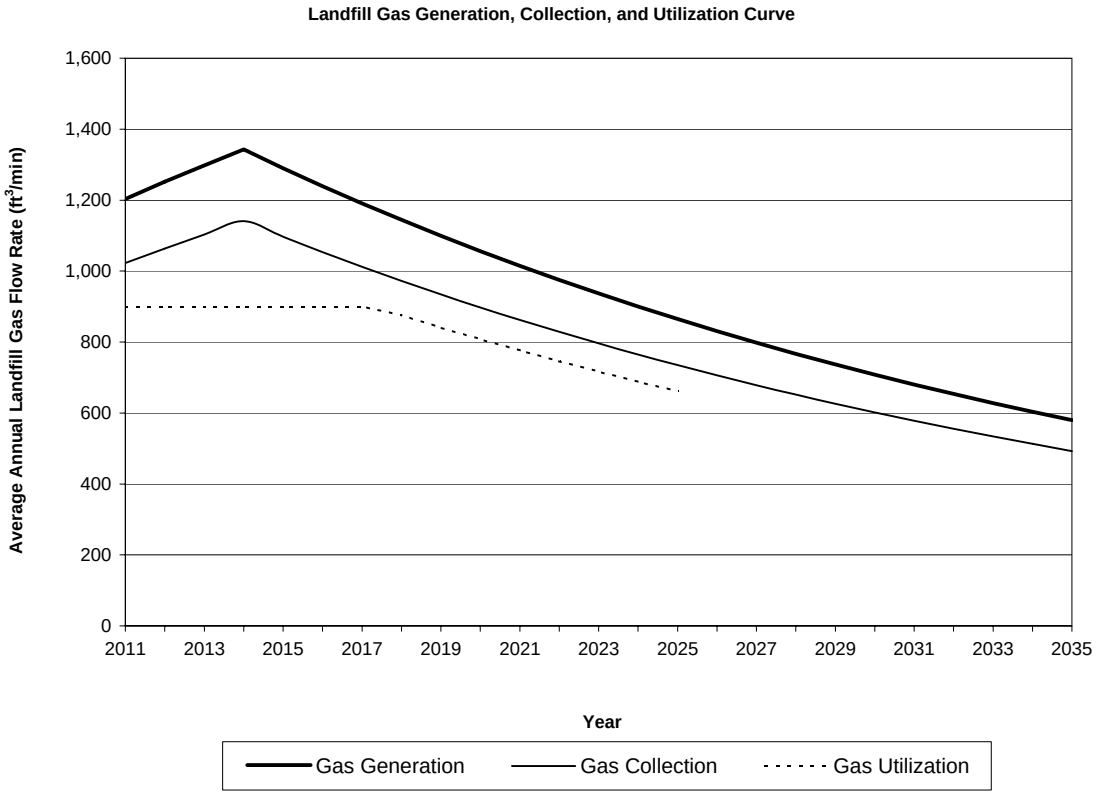
LFG Collection Efficiency:	85%	

Financial Assumptions

Loan Lifetime (years):	10	
Interest Rate:	8.0%	
General Inflation Rate:	2.5%	*(applied to O&M costs)*
Equipment Inflation Rate:	1.0%	
Marginal Tax Rate:	35.0%	
Discount Rate:	10.0%	
Down Payment:	20.0%	
Collection and Flaring Costs:	NOT Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	10.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5	



Case Study ID: Direct Use 4

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Private Finance
Including Costs for Gas Collection and Flare
LFGE Project Type: Direct Use
10-Mile Pipeline
Date: Friday, September 04, 2009

Disclaimer:
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The costs that are estimated by LFGcost are based on typical project designs and for typical landfill situations. The model attempts to include all equipment, site work, permits, operating activities, and maintenance that would normally be required for constructing and operating a typical project. However, individual landfills may require unique design modifications which would add to the cost estimated by LFGcost.

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Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	($668,637)	*(at year of construction)*
Internal Rate of Return:	6%	
Net Present Value Payback (yrs):	None	*(years after operation begins)*
Installed Capital Costs:		
Gas Collection and Flare:	$1,849,922	
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$3,366,330	
Total Capital Costs:	$6,312,860	
O&M Costs:	$408,089	*(for initial year of operation)*

These financial results include the costs associated with the gas collection and flaring system.

Environmental Benefits

Benefits from Collecting and Destroying Methane (during the life of the project):

Lifetime	
(million ft^3 methane):	3,754
($MMTCO_2E$):	1.51E+00
Average Annual	
(million ft^3 methane/yr):	250
($MMTCO_2E$/yr):	1.01E-01

Benefits from Avoided Direct Use of Fossil Fuels (during the life of the project):

Lifetime ($MMTCO_2E$):	1.72E-01
Average Annual ($MMTCO_2E$/yr):	1.15E-02

Landfill Characteristics

Open Year:	1994
Closure Year:	2014
Waste-In-Place at Closure (tons)	4,000,000
Average Waste Acceptance (tons/yr):	200,000
Average Depth of Landfill Waste (ft):	50
Area of LFG Wellfield to Supply Project (acres):	80

Landfill Gas Generation, Collection, and Utilization

Modeling Parameters for First-Order Decay Equation:

Methane Generation Rate, k (1/yr):	0.040
Methane Generation Capacity, L_o (ft^3/ton):	3,204
Methane Content of LFG:	50%

Generated During Project Lifetime (ft^3/min):

Minimum:	865
Annual Average:	1,120
Maximum:	1,343

Collected During Project Lifetime (ft^3/min):

Minimum:	735
Annual Average:	952
Maximum:	1,141

Project Size:	Defined by User	
Design Flow Rate for Project (ft^3/min):	1,000	

Utilized by Project (ft^3/min):

Annual Average:	828

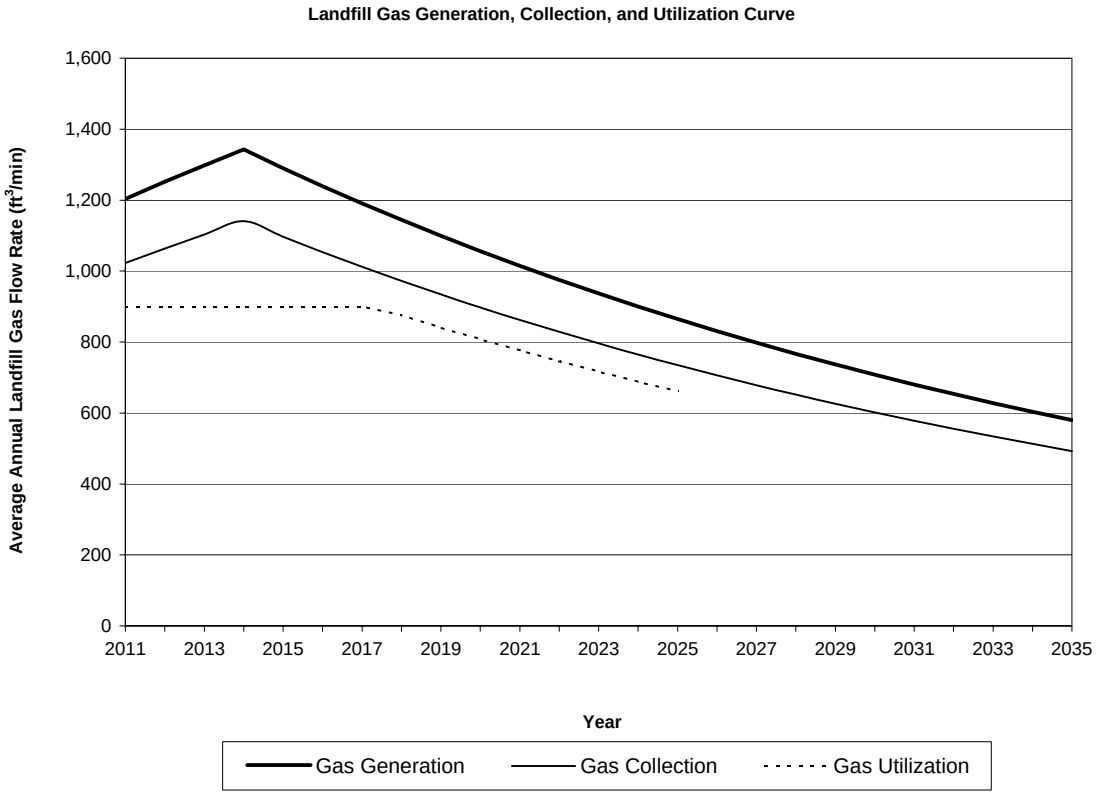
LFG Collection Efficiency:	85%	

Financial Assumptions

Loan Lifetime (years):	10	
Interest Rate:	8.0%	
General Inflation Rate:	2.5%	*(applied to O&M costs)*
Equipment Inflation Rate:	1.0%	
Marginal Tax Rate:	35.0%	
Discount Rate:	10.0%	
Down Payment:	20.0%	
Collection and Flaring Costs:	Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	10.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5	



Case Study ID: Direct Use 5

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Municipal Budget Finance

LFGE Project Type: Direct Use
5-Mile Pipeline

Date: Friday, September 04, 2009

Disclaimer:
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The costs that are estimated by LFGcost are based on typical project designs and for typical landfill situations. The model attempts to include all equipment, site work, permits, operating activities, and maintenance that would normally be required for constructing and operating a typical project. However, individual landfills may require unique design modifications which would add to the cost estimated by LFGcost.

Analyses performed using LFGcost are considered preliminary and should be used for guidance only. A detailed final feasibility assessment should be conducted by qualified landfill gas professionals prior to preparing a system design, initiating construction, purchasing materials, or entering into agreements to provide or purchase energy from a landfill gas project.

Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	$7,627,800	*(at year of construction)*
Internal Rate of Return:	40%	
Net Present Value Payback (yrs):	3	*(years after operation begins)*
Installed Capital Costs:		
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$1,683,165	
Total Capital Costs:	$2,779,773	
O&M Costs:	$128,782	*(for initial year of operation)*

These financial results DO NOT include the costs associated with the LFG collection and flaring system.

Environmental Benefits

Benefits from Collecting and Destroying Methane (during the life of the project):

Lifetime	
(million ft^3 methane):	3,754
($MMTCO_2E$):	1.51E+00
Average Annual	
(million ft^3 methane/yr):	250
($MMTCO_2E$/yr):	1.01E-01

Benefits from Avoided Direct Use of Fossil Fuels (during the life of the project):

Lifetime ($MMTCO_2E$):	1.72E-01
Average Annual ($MMTCO_2E$/yr):	1.15E-02

Landfill Characteristics

Open Year:	1994
Closure Year:	2014
Waste-In-Place at Closure (tons)	4,000,000
Average Waste Acceptance (tons/yr):	200,000
Average Depth of Landfill Waste (ft):	50
Area of LFG Wellfield to Supply Project (acres):	80

Landfill Gas Generation, Collection, and Utilization

Modeling Parameters for First-Order Decay Equation:

Methane Generation Rate, k (1/yr):	0.040
Methane Generation Capacity, L_o (ft^3/ton):	3,204
Methane Content of LFG:	50%

Generated During Project Lifetime (ft^3/min):

Minimum:	865
Annual Average:	1,120
Maximum:	1,343

Collected During Project Lifetime (ft^3/min):

Minimum:	735
Annual Average:	952
Maximum:	1,141

Project Size:	Defined by User	
Design Flow Rate for Project (ft^3/min):	1,000	

Utilized by Project (ft^3/min):

Annual Average:	828

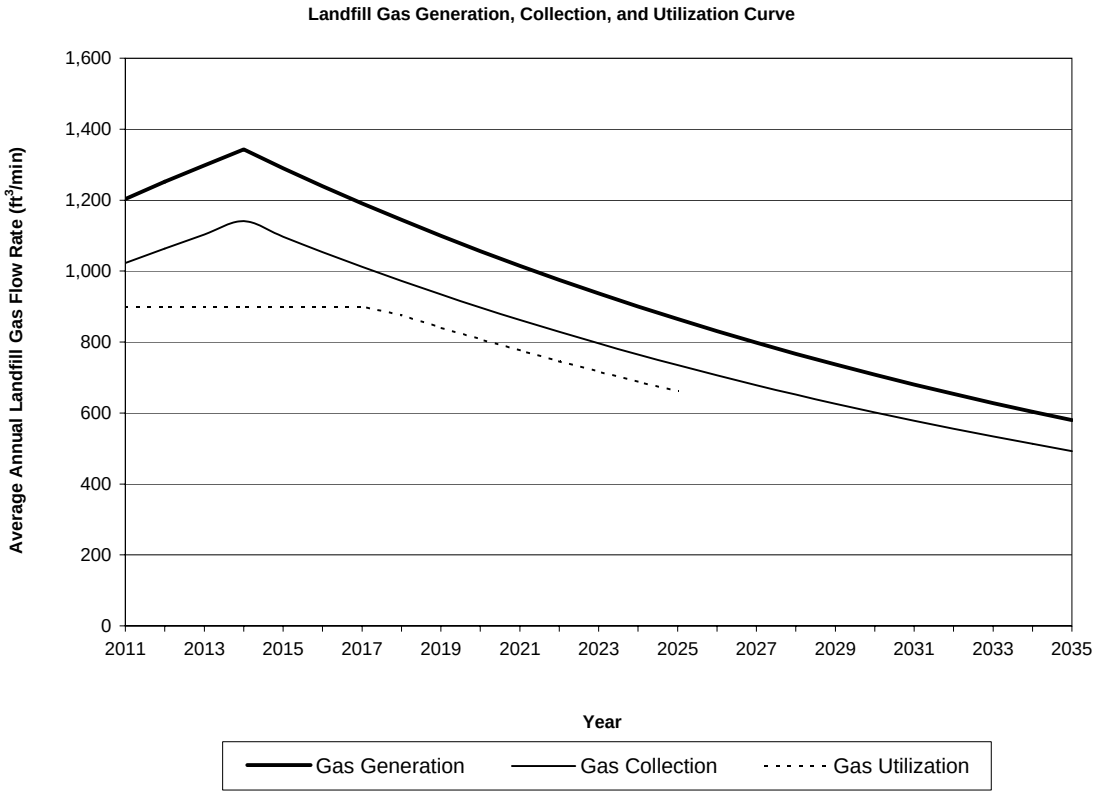
LFG Collection Efficiency:	85%	

Financial Assumptions

Loan Lifetime (years):	Not Applicable	
Interest Rate:	Not Applicable	
General Inflation Rate:	2.5%	*(applied to O&M costs)*
Equipment Inflation Rate:	1.0%	
Marginal Tax Rate:	Not Applicable	
Discount Rate:	6.0%	
Down Payment:	100.0%	
Collection and Flaring Costs:	NOT Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	5.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5.00	



Case Study ID: Direct Use 6

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Municipal Bond Finance

LFGE Project Type: Direct Use
5-Mile Pipeline

Date: Friday, September 04, 2009

Disclaimer:
LFGcost is a landfill gas energy project cost estimating tool developed for EPA's LMOP. LFGcost estimates landfill gas generation rates using a first-order decay equation. This equation is used to estimate generation potential but can not be considered an absolute predictor of the rate of landfill gas generation. Variations in the rate and types of incoming waste, site operating conditions, and moisture and temperature conditions may provide substantial variations in the actual rates of generation.

The costs that are estimated by LFGcost are based on typical project designs and for typical landfill situations. The model attempts to include all equipment, site work, permits, operating activities, and maintenance that would normally be required for constructing and operating a typical project. However, individual landfills may require unique design modifications which would add to the cost estimated by LFGcost.

Analyses performed using LFGcost are considered preliminary and should be used for guidance only. A detailed final feasibility assessment should be conducted by qualified landfill gas professionals prior to preparing a system design, initiating construction, purchasing materials, or entering into agreements to provide or purchase energy from a landfill gas project.

Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	$7,501,924	*(at year of construction)*
Internal Rate of Return:	92%	
Net Present Value Payback (yrs):	2	*(years after operation begins)*
Installed Capital Costs:		
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$1,683,165	
Total Capital Costs:	$2,779,773	
O&M Costs:	$128,782	*(for initial year of operation)*

These financial results DO NOT include the costs associated with the LFG collection and flaring system.

Environmental Benefits

Benefits from Collecting and Destroying Methane (during the life of the project):

Lifetime	
(million ft^3 methane):	3,754
($MMTCO_2E$):	1.51E+00
Average Annual	
(million ft^3 methane/yr):	250
($MMTCO_2E$/yr):	1.01E-01

Benefits from Avoided Direct Use of Fossil Fuels (during the life of the project):

Lifetime ($MMTCO_2E$):	1.72E-01
Average Annual ($MMTCO_2E$/yr):	1.15E-02

Landfill Characteristics

Open Year:	1994
Closure Year:	2014
Waste-In-Place at Closure (tons)	4,000,000
Average Waste Acceptance (tons/yr):	200,000
Average Depth of Landfill Waste (ft):	50
Area of LFG Wellfield to Supply Project (acres):	80

Landfill Gas Generation, Collection, and Utilization

Modeling Parameters for First-Order Decay Equation:

Methane Generation Rate, k (1/yr):	0.040
Methane Generation Capacity, L_o (ft^3/ton):	3,204
Methane Content of LFG:	50%

Generated During Project Lifetime (ft^3/min):

Minimum:	865
Annual Average:	1,120
Maximum:	1,343

Collected During Project Lifetime (ft^3/min):

Minimum:	735
Annual Average:	952
Maximum:	1,141

Project Size:	Defined by User	
Design Flow Rate for Project (ft^3/min):	1,000	

Utilized by Project (ft^3/min):

Annual Average:	828

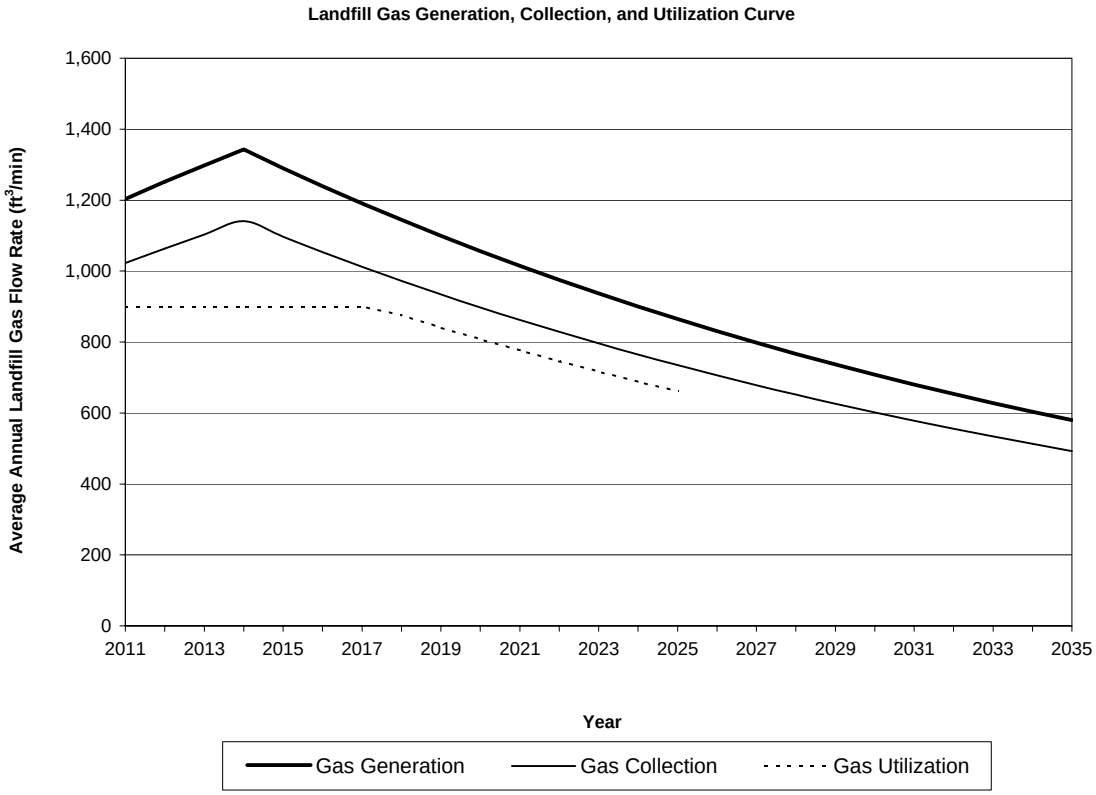
LFG Collection Efficiency:	85%	

Financial Assumptions

Loan Lifetime (years):	10	
Interest Rate:	6.0%	
General Inflation Rate:	2.5%	*(applied to O&M costs)*
Equipment Inflation Rate:	1.0%	
Marginal Tax Rate:	Not Applicable	
Discount Rate:	6.0%	
Down Payment:	20.0%	
Collection and Flaring Costs:	NOT Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	5.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5.0	



Case Study ID: Direct Use 7

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Municipal Budget Finance
Including Costs for Gas Collection and Flare
LFGE Project Type: Direct Use
5-Mile Pipeline
Date: Friday, September 04, 2009

Disclaimer:
LFGcost is a landfill gas energy project cost estimating tool developed for EPA's LMOP. LFGcost estimates landfill gas generation rates using a first-order decay equation. This equation is used to estimate generation potential but can not be considered an absolute predictor of the rate of landfill gas generation. Variations in the rate and types of incoming waste, site operating conditions, and moisture and temperature conditions may provide substantial variations in the actual rates of generation.

The costs that are estimated by LFGcost are based on typical project designs and for typical landfill situations. The model attempts to include all equipment, site work, permits, operating activities, and maintenance that would normally be required for constructing and operating a typical project. However, individual landfills may require unique design modifications which would add to the cost estimated by LFGcost.

Analyses performed using LFGcost are considered preliminary and should be used for guidance only. A detailed final feasibility assessment should be conducted by qualified landfill gas professionals prior to preparing a system design, initiating construction, purchasing materials, or entering into agreements to provide or purchase energy from a landfill gas project.

Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	$2,971,556	*(at year of construction)*
Internal Rate of Return:	15%	
Net Present Value Payback (yrs):	8	*(years after operation begins)*
Installed Capital Costs:		
Gas Collection and Flare:	$1,849,922	
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$1,683,165	
Total Capital Costs:	$4,629,695	
O&M Costs:	$408,089	*(for initial year of operation)*

These financial results include the costs associated with the gas collection and flaring system.

Environmental Benefits

Benefits from Collecting and Destroying Methane (during the life of the project):

Lifetime	
(million ft^3 methane):	3,754
($MMTCO_2E$):	1.51E+00
Average Annual	
(million ft^3 methane/yr):	250
($MMTCO_2E$/yr):	1.01E-01

Benefits from Avoided Direct Use of Fossil Fuels (during the life of the project):

Lifetime ($MMTCO_2E$):	1.72E-01
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Landfill Characteristics

Open Year:	1994
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Minimum:	735
Annual Average:	952
Maximum:	1,141

Project Size:	Defined by User	
Design Flow Rate for Project (ft^3/min):	1,000	

Utilized by Project (ft^3/min):

Annual Average:	828

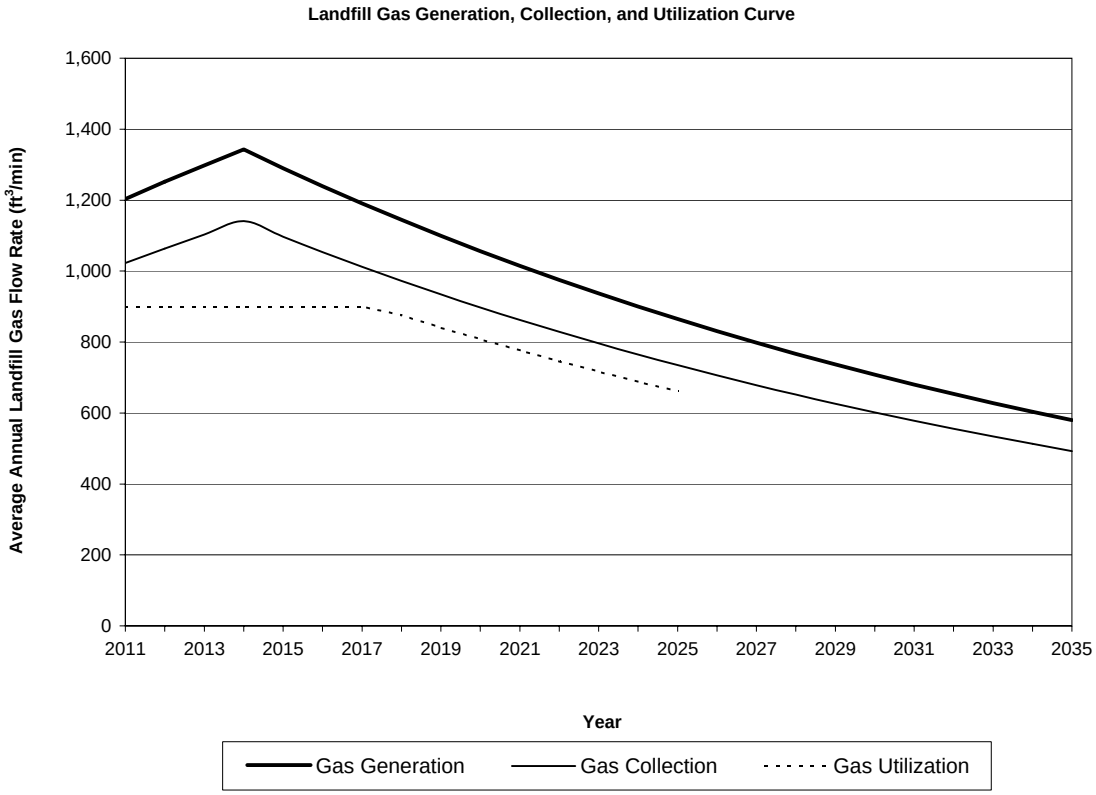
LFG Collection Efficiency:	85%	

Financial Assumptions

Loan Lifetime (years):	Not Applicable	
Interest Rate:	Not Applicable	
General Inflation Rate:	2.5%	*(applied to O&M costs)*
Equipment Inflation Rate:	1.0%	
Marginal Tax Rate:	Not Applicable	
Discount Rate:	6.0%	
Down Payment:	100.0%	
Collection and Flaring Costs:	Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	5.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5.00	



Case Study ID: Direct Use 8

U.S. EPA Landfill Methane Outreach Program

Landfill Gas Energy Cost Model

LFGcost, Version 2.0

Summary Report

Landfill Name or Identifier: Municipal Bond Finance
Including Costs for Gas Collection and Flare
LFGE Project Type: Direct Use
5-Mile Pipeline
Date: Friday, September 04, 2009

Disclaimer:
LFGcost is a landfill gas energy project cost estimating tool developed for EPA's LMOP. LFGcost estimates landfill gas generation rates using a first-order decay equation. This equation is used to estimate generation potential but can not be considered an absolute predictor of the rate of landfill gas generation. Variations in the rate and types of incoming waste, site operating conditions, and moisture and temperature conditions may provide substantial variations in the actual rates of generation.

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Summary Results

Project Start Year:	2011	
Project End Year:	2025	
Project Type:	Direct Use	
Financial Results:		
Net Present Value:	$2,761,909	*(at year of construction)*
Internal Rate of Return:	24%	
Net Present Value Payback (yrs):	6	*(years after operation begins)*
Installed Capital Costs:		
Gas Collection and Flare:	$1,849,922	
Skid-mounted Filter, Compressor, and Dehydration Unit:	$1,096,608	
Pipeline to convey gas to project site:	$1,683,165	
Total Capital Costs:	$4,629,695	
O&M Costs:	$408,089	*(for initial year of operation)*

These financial results include the costs associated with the gas collection and flaring system.

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Benefits from Collecting and Destroying Methane (during the life of the project):

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Discount Rate:	6.0%	
Down Payment:	20.0%	
Collection and Flaring Costs:	Included	

Direct Use Production and Sales Summary

Pipeline Length From Landfill to End User (mi):	5.0	
LFG Average Utilization (million Btu/yr):	220,091	*(during the life of the project)*
Initial Year LFG Price ($/million Btu):	5.0